ED 463 027   JC 020 254

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TITLE   Building an Information-Rich Environment in a Community
                College: The Decision Support System at City College of San
                Francisco.
INSTITUTION   City Coll. of San Francisco, CA. Office of Institutional
                Research, Planning and Grants.
PUB DATE   2001-00-00
NOTE   20p.; Paper presented at the Annual Meeting of the Research
                and Planning Group for California Community Colleges (39th,
                Lake Arrowhead, CA, May 2-4, 2001).
AVAILABLE FROM For full text: http://www.rpgroup.org.
PUB TYPE   Reports - Descriptive (141)
EDRS PRICE   MF01/PC01 Plus Postage.
DESCRIPTORS   *Access to Education; *Access to Information; Administrator
                Attitudes; College Role; Community Colleges; Educational
                Assessment; *Educational Technology; *Information Networks;
                Institutional Research; Professional Development; Student
                Attitudes; Teacher Attitudes; Two Year Colleges
IDENTIFIERS   *City College of San Francisco CA

ABSTRACT
                This document is a report on the City College of San
Francisco Decision Support System (DSS). The DSS is a Web-based information
system, designed to provide quick access to college information and services
for students, faculty, and staff. It includes data on student demographics,
course offerings, productivity of departments, student success rates, course
completion percentages, degrees, and certificates. Data can be obtained
through the DSS for specific courses and sections as well as for different
campuses and the entire community college. Survey results from students,
faculty, and staff show that the DSS is viewed as a very useful college
service. Other survey findings include: (1) the chair of the Mathematics
Department used the system to look for unmet demand among match courses and
sections; (2) the English Department was able to reduce the number of
students turned away from classes by 400; (3) by looking at individual
campuses and student characteristics, administrators were able to plan the
most appropriate courses for students attending a specific campus; and (4)
the DSS made it easy to answer a benchmarking survey from another college.
This report recommends that the college use the DSS to make more informed
decisions on programs and services. Appendices provide specific information
on the technical processes of the DSS and available databases. (MKF)

Building an Information-Rich Environment in a Community College:

The Decision Support System at City College of San Francisco

Robert S. Gabriner

Building an Information-Rich Environment in a Community College:
The Decision Support System at City College of San Francisco

City College of San Francisco is building an information system based upon the design principles of a common database accessible to all members of the college community. Called the Decision Support System (DSS), it is a web-based tool that provides quick access to data and information about the college. Currently comprised of four modules, the DSS includes data on student demand for courses and classes; productivity of departments; student success as measured by grades, course completion, degrees and certificates; and student characteristics. Since the inception of the DSS, the college is beginning to see some changes that are small but potentially significant:

- Information and data are no longer perceived as a scarce resource.
- Data is increasingly the main driver of decisions.
- Information and data are increasingly perceived as reliable.
- Deans and chairs are more vigilant about bad data and information.
- The Office of Research is now emerging as the office responsible for data integrity and quality control.

The Keeper of Information

Information and data are valuable currencies in institutions of higher education. To learn about a department's enrollments or the success of a program's students requires the right connections with the right people, a plethora of time and patience, and a good sense of humor.

City College of San Francisco faced a particularly acute version of this state of affairs because of its size and complexity–with 2400 employees, we serve more than 95,000 students annually in over nine campuses and 100 locations. But the situation is now changing because of two developments.

First, City College invested in a new management information system, SCT Banner, and simultaneously gave individual departments the ability to access data from this system, via a new college intranet, without depending upon a centralized IT department. The conversion from a hierarchical and limited access system to a decentralized, open access system encouraged a few college departments to hire technical specialists who could pull data and information on an as-needed basis. This enabled at least the units with specialists the capacity to access information quickly without hindrance. Most units, however, could not afford specialists and still had to choose between navigating a complex set of rules to access data, waiting until a programmer from ITS generated the report for the unit, or joining the queue at institutional research.

Institutional researchers responded to this need via the second development: the creation of the City College Decision Support (DSS) system. Researchers built as an easy-to-use web-based information system linked directly to a data-warehouse containing student data from spring 1998 to the present.[ii]

The DSS provides easy access to college data and an easy-to-use procedure to get answers to questions about enrollment, student demand for classes, student success and department-level productivity. You can find course- and section-level data as well as campus-level and collegewide data; term-level data and academic year data is available. For example, you can find out how many students enrolled in and finished a course and, for that course, how many students enrolled in each class section. You can find out what the level of student demand was for that course or a specific section within that course. You can find out the average age of students enrolled in special programs, whether these students are remaining enrolled and what kinds of grades they are receiving—and you can cross-reference these items to evaluate which students seem to benefiting the most from a given program. Further, you can easily download this information with the click of a button and create a graph in MS Excel with just three more clicks. In other words, the DSS is a flexible and relatively comprehensive system that provides users with the power to extract different levels of simple or complex information at will.

What is the Decision Support System

The Decision Support System is a web-based tool that provides quick access to data and information about the college. It is an interactive database that allows the user to choose from a set of pull-down menus containing specific information that is then displayed in easy-to-read tables.[iii]

The DSS is housed on the CCSF Research and Planning website and currently consists of four database modules:
1. Student demand for courses and sections
2. Student success as measured by GPA, course completion, and persistence
3. Enrollment data
4. Productivity data

Each module provides the user with historical data by semester from spring 1998 to the present. The data within each module is organized by department, campus and special program. We built the first module of the Decision Support System in spring 2000, and launched three more in spring 2001.

Background

The Decision Support System was built with funds from the U.S. Department of Education Title III grant entitled "Strengthening Institutions," awarded to CCSF in 1995. At that time, administrators and faculty depended upon the information technology services unit for current reports on student enrollment and student success data; the Office of Research provided analyses of both current and historical data. The Office of Research also published an annual fact book containing data on an array of topics such as student characteristics, faculty characteristics, student success measures, and allocation of financial aid. We also responded to individual queries since our annual report could not present all of the information or provide it in a way that met individual needs. In addition, the research office was responsible for an increasing number of state and federal mandates for institutional accountability on measures of student access, student success, and transfer.

The research staff found itself facing a dilemma: we felt that members of the college community should have easy access to data, but the research office should not have to expend all of its staff time providing that function. We began developing some ideas of how to preserve the office's original mission of research and analysis of institutional issues, while building a clearinghouse for institutional information and data—a function that all of us thought should be automated.

In fall 1996, the CCSF research staff was invited to present their views in a special issue of the Metropolitan Universities magazine focused on community college transfer. We stated that our goal was to "...to help build a college culture capable of utilizing information and research." To construct such a culture, we needed, "...an information-rich environment, containing regular feedback loops to faculty, staff, administrators, and students, and that engages the college community in reflective discussions." We added

that an informed college community helps to create a culture that enhances student success, and ultimately promotes higher levels of student outcomes, including transfer success.

We stated that if a college is to promote communication and trust among its stakeholders, then, "information must be made available to everyone. This facilitates the planning process and leads to the development of programs and policies that help create student success."[iv]

We were fortunate that our proposal to the Department of Education was funded, allowing us to begin steps to implement our vision. We built the City College Decision Support System based upon the following set of design principles[v]:

1. Providing a solid basis for decision-making is the fundamental function of the system; other systems will adequately address and monitor specific institutional transactions or individual student records.
2. A decision-making system relies upon a source of recognized common information for the college, and that is the college's Banner data system.
3. The DSS will focus on key concerns of decision-makers including
   - Student demand for classes and enrollments in courses
   - Levels of productivity of specific departments and specific courses
   - Student success as measured by performance measures mandated by the state and by the college itself
   - Characteristics of students enrolling in college courses and programs
4. The database should be integrated so that cross tabulations between student characteristics and student success can be examined.
5. The database should be longitudinal so that users can view trends within the college over time.
6. The majority of users will be deans and department chairs.
7. The DSS will be sufficiently flexible to grow and change as the college's priorities and user needs change.

It took us five years to build the Decision Support system—three years to discover that we were building it the wrong way, and two years to construct it properly. During the first three years, our strategy focused on using a Banner product that had been beta-tested but had virtually no use experience within the world of postsecondary institutions. We found that building a decision support system with a complex tool dependent upon the main college server and a strict set of client-server relationships did not work. Once we decided to build a web-based system, the actual time to completion was less than two years.

Navigating the Decision Support System
To access the Decision Support System, the user goes to the City College homepage and then finds the link for the homepage of the Office of Research, Planning and Grants. This homepage contains a link to the homepage of the Decision Support System that contains five pull-down menus. The first menu has four types of information about the

DSS itself including a description of the system, a glossary of terms and definitions, a schema of the technical specifications for the system, and answers to a list of frequently asked questions. The other four menus refer to "modules" which contain various cuts of data including collegewide (credit and noncredit), campus-based, and departmental figures for specific terms or academic years.
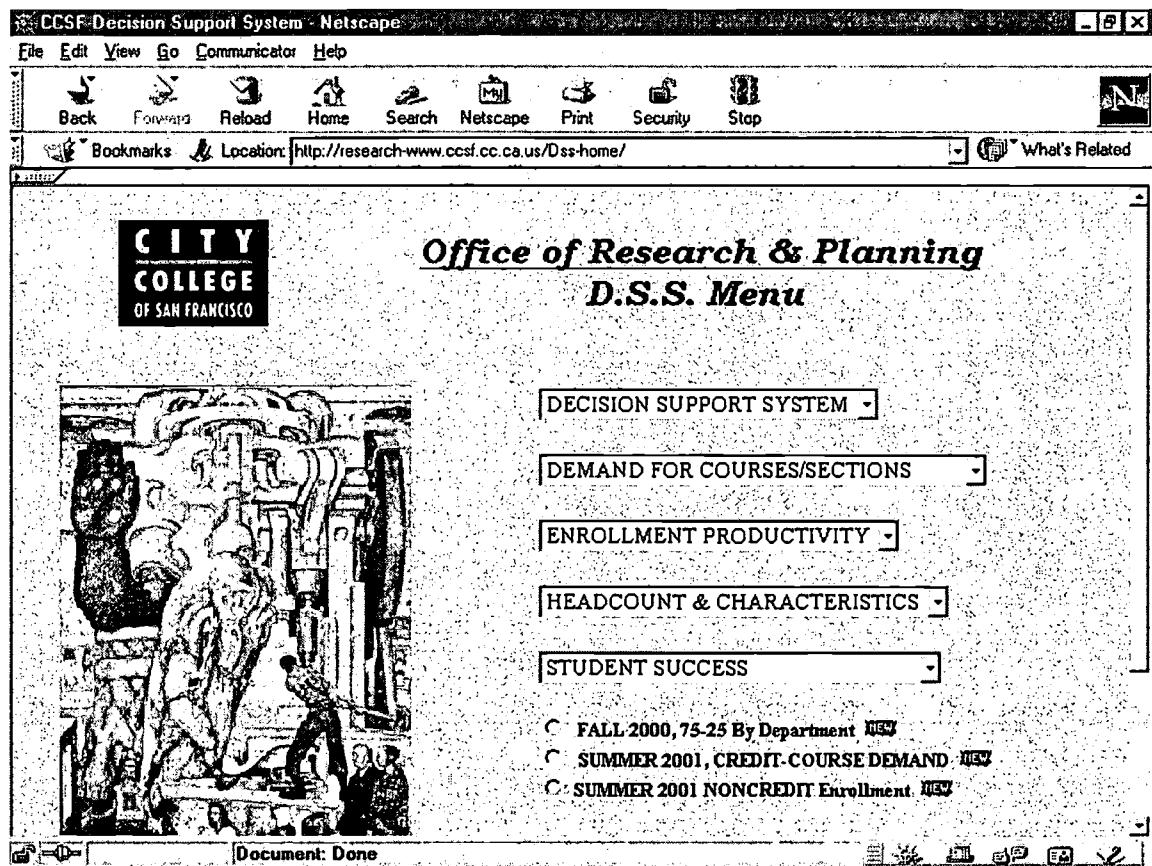
The Demand for Courses/Sections module enables the user to access the number of students successfully enrolling in courses and class sections, and the numbers of students failing to register because the course or section was closed. Currently, users can access demand data from Spring 1998 to the present for every course and section offered in the credit mode at City College.

The Enrollment Productivity module provides data by semester for each department's FTES, Weekly Student Contact Hours, Headcount at Census Week One, Positive Attendance Hours and total Number of Sections offered by the department. This module will soon be expanded to include department data on Average Class Size, Faculty Load, as well as course- and campus-level data for all these items.

The Headcount and Characteristics is the third module and includes student demographic data by course, department, campus, and special program, as well as collegewide figures. This module allows the user to profile the students registered in a program by every data element included in the college application from demographics

such as age, ethnicity and gender to zip code, student load, and educational goal. The user can select highly specific cohorts and can cross tabulate these data, too.

The Student Success module provides data on student success as defined by completion of a certificate or a degree, grade point average, units completed, and successful course completion. The module allows the user to examine student success data by course, department, campus, and special program, as well as collegewide, and enables the user to choose among 10 demographic and background variables to run correlations.

Once the user decides upon a module such as Enrollment Productivity or Student Success, the user then can select a dataset within that module such as Student Success by Department and Academic year:
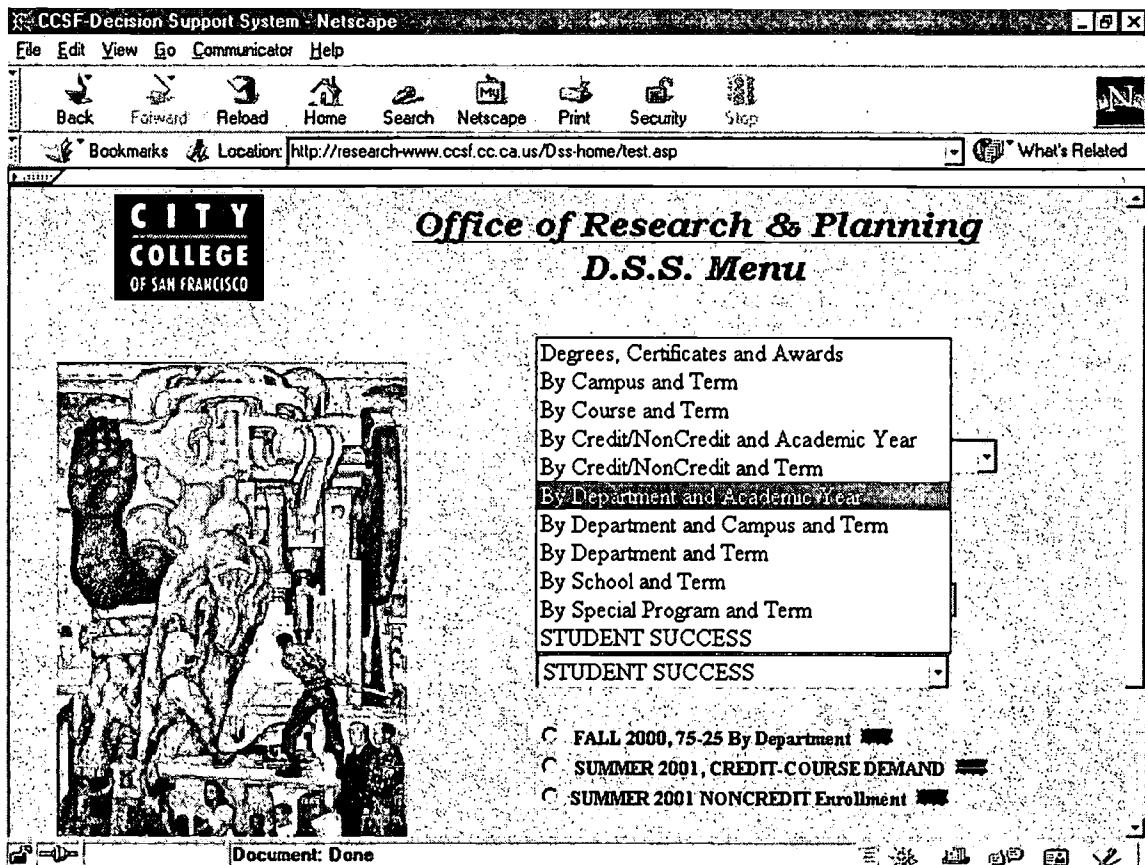
The DSS will then take the user to a screen to select the demographic and background variables. Many correlations are possible with this screen given the numbers of data elements and success measures. As an example, the user could choose to find out the course success rates of students enrolled in the behavioral science program declaring an educational goal of attaining a two year or four year degree for the period from Spring 1998 to Summer 2000.
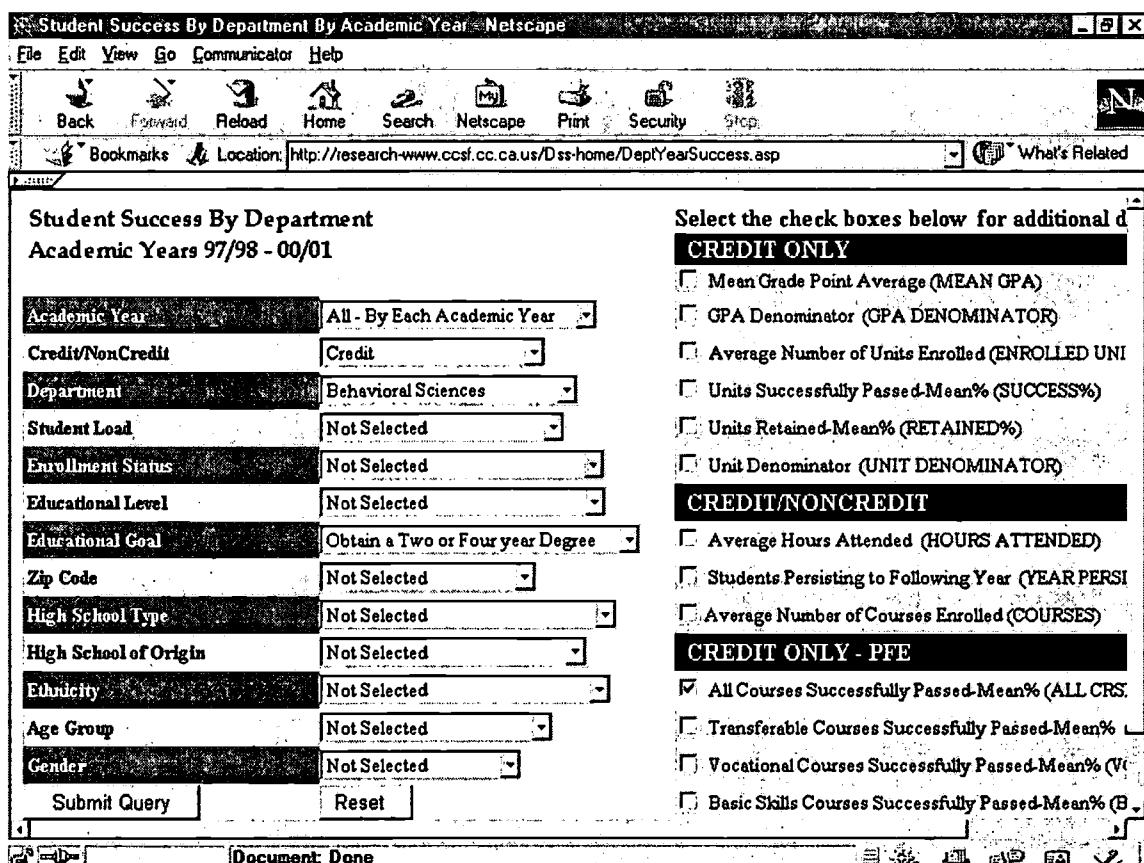
Student Success By Department Netscape — browser window

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Stop

Bookmarks Location: http://research-www.ccsf.cc.ca.us/Dss-home/DeptYearSuccess.asp What's Related

Student Success By Department
Academic Years 97/98 - 00/01

Field	Selection
Academic Year	All - By Each Academic Year
Credit/NonCredit	Credit
Department	Behavioral Sciences
Student Load	Not Selected
Enrollment Status	Not Selected
Educational Level	Not Selected
Educational Goal	Obtain a Two or Four year Degree
Zip Code	Not Selected
High School Type	Not Selected
High School of Origin	Not Selected
Ethnicity	Not Selected
Age Group	Not Selected
Gender	Not Selected

Submit Query   Reset

Select the check boxes below for additional d

CREDIT ONLY
- [ ] Mean Grade Point Average (MEAN GPA)
- [ ] GPA Denominator (GPA DENOMINATOR)
- [ ] Average Number of Units Enrolled (ENROLLED UNI
- [ ] Units Successfully Passed-Mean% (SUCCESS%)
- [ ] Units Retained-Mean% (RETAINED%)
- [ ] Unit Denominator (UNIT DENOMINATOR)

CREDIT/NONCREDIT
- [ ] Average Hours Attended (HOURS ATTENDED)
- [ ] Students Persisting to Following Year (YEAR PERSI
- [ ] Average Number of Courses Enrolled (COURSES)

CREDIT ONLY - PFE
- [x] All Courses Successfully Passed-Mean% (ALL CRS.
- [ ] Transferable Courses Successfully Passed-Mean%
- [ ] Vocational Courses Successfully Passed-Mean% (V(
- [ ] Basic Skills Courses Successfully Passed-Mean% (B

Document: Done

BEST COPY AVAILABLE

Once the query is submitted by clicking on the Submit Query button, a table appears on the screen with the data requested:

```
DEPARTMENT Area Success Query Result - Netscape                                  _ 🗗 ×
File  Edit  View  Go  Communicator  Help
   Back   Forward   Reload   Home   Search   Netscape   Print   Security   Stop        N
   Bookmarks   Location: http://research-www.ccsf.cc.ca.us/Dss-home/DeptSuccessQ.asp    What's Related
```

Student Success By Department

Spring 1998 – Fall 2000

Glossary of Terms

TERM	YEAR	CR/NC	DEPARTMENT	EDGOAL	Number of Students	ALL CRSES%
Fall	1998	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	1388	56.49
Fall	1999	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	1573	60.68
Fall	2000	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	1588	59.88
Spring	1998	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	1183	65.89
Spring	1999	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	1309	62.31
Spring	2000	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	1371	61.79
Summer	1998	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	329	78.91
Summer	1999	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	438	75.4
Summer	2000	Credit	Behavioral Sciences	Obtain a Two or Four year Degree	402	80.64

```
   <<   <   >   >>      New Query
            Page 1 of 1
   Document: Done
```

The table indicates success rates seem to be highest during the summer and lowest in the fall semester. The user can also opt to click on the download button to save the data in an Excel spread sheet for further analysis.

Marketing the Decision Support System

Our fondest nightmare was that we would build the DSS, and no one would use it. We knew that there was a great deal of interest in easy access to institutional data, but we also knew that department chairs and deans are extremely busy people focused on their tasks within the college and needing information of direct relevance to those tasks. These considerations, of course, form part of the basis for the data elements included in the system.

To further insure that the DSS would be used, the research staff prepared a series of presentations, unveiling the DSS with customized examples chosen to resonate with the specific interests of the department chairs and deans. (For example, when we presented the DSS in front of liberal arts department chairs, we used data from liberal arts

departments. When we presented for the campus deans, campus data was the focus.) We hoped this would show how relevant and rich the available data is, as well as how easily accessed. We also produced a user's manual detailing how the DSS could be used and providing different scenarios to illustrate how the DSS could help with enrollment planning, grant proposals, program review, or budget arguments such as those needed to request a new faculty position. We presented the DSS to all 52 department chairs and the deans from all the college's divisions—a total of approximately 100 people. We asked everyone for feedback about how the system has been working for them, and we promised to provide them with updates through the college listserv.

The results from this initial effort were very positive. Over 400 users visit the DSS monthly. A survey conducted in May 2001 supports our perception that the DSS is taking root among department chairs. Here are some examples of how the system is being used:

- The chair of our math department uses the system to look for unmet demand among math courses and sections. In the past, he knew that students were being turned away, but had no idea how many students. Knowing how many students are enrolled in courses and how many students could not get into a course or section has allowed him to cancel certain sections and add more sections with greater confidence. He has also been able to ask for additional faculty when there is a clear unmet demand.
- The English department was able to reduce the number of students turned away from classes from 600 to 200. By getting these students into needed classes, we expedited their sojourn at the college.
- CCSF has a number of campuses. Our ESL chair experimented with the DSS by looking up student zip codes by campus. She discovered that the most frequent zip code for students in non-credit ESL courses was a zip code close to our main campus where we have no non-credit ESL classes. Given that transportation can be a problem for our students, she could make a persuasive case for holding a non-credit class at our main campus. In a different case where we had to move a campus, we were able to check the zip codes of those who attended to see if the move changed where people came from. Also, by looking at individual campuses and student characteristics, like age and educational background, we were able to plan the most appropriate courses for students attending that campus.
- A college employee received a benchmarking survey from another college that wanted to compare their college with ours. They asked questions about unduplicated head counts, the percentage of students who were foreign and resident, and other questions. The DSS made it easy to answer the survey and help out the other college.
- A department chair was able to use the system to dispel a perception that his department was not serving basic skills students. By looking up the numbers he was able to document that his department served a substantial number of basic skills students semester after semester. In another case, there was some discussion about whether enrollment declined more between initial enrollment and census day, or between census day and final enrollment. It was easy to determine which was correct.

- We wanted to apply for funds to interest underrepresented minority students to become math and science teachers. We looked at science and math programs by ethnicity and gender as well as demand for particular child development classes that have a teacher preparation focus. The DSS helped us supply numbers. In addition, the DSS provided us baselines for creating measurable objectives for the program. When the grant is implemented, the DSS will help us document the increased numbers.
- For some grant evaluations, there are often specific indicators we need to use in our reporting, for example, student success in a certain course after a new curriculum has been developed; or student retention of a group who were involved in a particular intervention. The DSS gives us easy access to this information.

Although, there is evidence that we have scored a success with the deans and department chairs, we do not intend to stop promoting the DSS. Our plan is to market the DSS with workshops each semester. We also plan to regularly distribute brief hard-copy reports from the DSS to all chairs and deans to continue to show them what the system is capable of doing for them. We will broadcast additions to the data which expand its potential for use and relevance. We plan to help faculty share with each other how they are using the data to assist in their planning, decision-making, and grant proposals as well as uses that we don't even know yet.

Information-Rich Environments
The Decision Support System has been available to faculty for six months now and we are beginning to see some changes at our college; these are small changes but potentially significant ones.

Information and data are no longer a scarce resource. A group of department chairs and deans attended a conference recently during which each participating college team was asked to identify the major barriers to change and innovation in their institution. Almost all identified "lack of information and reliable data" as one of their primary obstacles. Five years ago, CCSF faculty and staff shared the same data issues. This time, however, the CCSF group did not perceive this as a problem and did not list it as a barrier. We see this as a real sign of a change.

Information and data are increasingly being used to determine college decisions. If a department is going to gain a new faculty position, if additional classes are to be scheduled for a specific program, or if a program appears to need additional resources, the chairs and the deans often turn to the Decision Support System to gather the appropriate data. The college is increasingly relying upon data to make decisions rather than perceptions or politics.

Information and data are increasingly perceived as reliable. Over the past five years, one hears fewer complaints about the reliability of data due in part to the new Banner system and improved data entry procedures. To further ensure data reliability, the

research office is continually asking chairs and deans to verify and correct reports and data presented to them from the Decision Support System.

Deans and chairs are more vigilant about bad data and information. Partly as a result of the growth of accountability requirements from Partnership for Excellence and VTEA, chairs and deans are far more concerned about data accuracy. Increased familiarity with the data produces an ability to spot problems within the data. For example, there is a growing desire among vocational departments to ensure the accuracy of certificate and degree reports as well as the total numbers of students listed as economically disadvantaged.

Deans and chairs are more vigilant about bad data and information. Partly as a result of the growth of accountability requirements from Partnership for Excellence and VTEA, chairs and deans are far more aware of when data does not look right. For example, there is a growing concern among vocational departments about the accuracy of certificate and degree reports as well as the total numbers of students listed as economically disadvantaged.

The role of the Office of Research is changing. We had thought that building the Decision Support System would allow the research staff more time to conduct research instead of act as a clearinghouse for data and information. That is only partially true; the other part is that the research staff is now emerging as the office responsible for data integrity and quality control. In addition, the research staff is now facing new data and information needs that will require constructing additional modules in the DSS.

Next Steps
We are planning three next steps:

1. *Continue marketing the DSS to the college.* We must continue to place the DSS in front of our chairs and deans, and we need to add the instructional and counseling faculty and staff. We will provide demonstrations on a regular basis during the 2001/02 academic year.

2. *Continue to sponsor training workshops.* If administrators, faculty and staff are to effectively use the DSS, they must learn how it works. We plan to offer frequent training workshops (no longer than 30 minutes) throughout the college campuses.

3. *Add new modules to the system.* We are currently working on a quick-view menu that will allow the user to point and click on a longitudinal/trend report with three or four data elements displayed over a specific number of semesters or years. We want to add a graphic option for these reports so that users can view them as charts and graphs. We also are planning to provide more data at the class level with access for instructors only.

APPENDIX

1. Technical Processes of the Decision Support System

2. Databases of the Decision Support System

3. Endnotes

1. Technical Processes of the Decision Support System

There are two major processes to the DSS. One is the data extraction process. The DSS uses two sources of data. One source is a text extract derived from a SQR program. It provides the basic class and student data. This data is extracted from the production database at the end of each semester. A second source of data is a direct extract from the production database using the SAS SQL procedure. Whole Oracle tables are pulled over from the production database and merged with the text extracts mentioned above. This data are massaged in SAS and output to an ACCESS database that provides the base for the second DSS process. The following display provides a graphic and textual narrative of how the Decision Support System data is transferred from the College's data information system to our data-warehouse.

Banner is CCSF's main production database. It houses Student, Financial Aid, Finance and Human Resources data.

BANNER

We extract data from Banner using SAS, SQR or PL/SQL to generate text files, Excel workbook or Access database.

(SQL) SAS/SQR

This step is needed only if the data source is either a text or an Excel file

ASCII / MS-EXCEL

We create an ACCESS database from text or Excel file, and transform the data into distinct data fields (using a pivot table) if needed. We clean up the data by eliminating invalid records.

MS-ACCESS

We load the Access database to our RESEARCH Web-server using MS SQL Server. This process also involves creating new tables if needed to group the data or to break the data into smaller, more manageable, and more efficient database.

SQL-SERVER (Data Warehouse)

We create Active Server Pages (ASP) allowing users To enter queries and display results as users requested. The pages also have options for users to download the query result as a tab-delimited, comma-delimited or Excel format file.

Active Server Pages (ASP)

DSS (INTERNET)
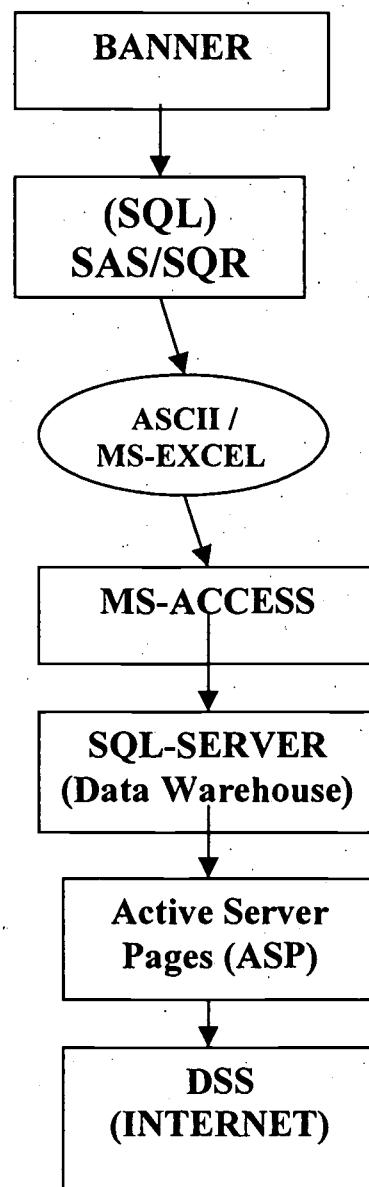
2. Databases of the Decision Support System

Table 1

Areas of Data in the Decision Support System

Academic Area	Focus
Course and Section Demand	Registration
Productivity	Departments
Headcount and Characteristics	Students
Success	Students

Table 2

Student Data in the Headcount and Success Modules

Academic Segment	Term	Year
College Division (CR/NC)	X	X
Department	X	X
Campus	X	
Department and Campus	X	
Course	X	
School		
Degrees, Certificates, Awards		X
Full & Part Time Employees (75/25 Ratio)	Fall Term Only	
Special Program	X	

Databases of the Decision Support System

Table 3

Fields Presented in the DSS by which Unduplication Occurs[1]

Unduplication Fields	Description
Year	Calendar year
Term	Semester of study
Division	Credit or Non Credit Course Enrollment
Campus	Location of Student course Attendance
School	Subject Matter Area in which the course resides
Department	Department of Course (i.e. math or English etc)
Subject	Subject in Department (i.e. Accounting in Business)
Course	The Subject plus the course number (i.e. ENGL 1A)
CRN	The Unique Course Identification Number
Degree, Award, Certificate	Degree, Certificate or Award Name
Special Programs	The Special Program in which the Course resides or the Student is Enrolled (i.e. EOPS, DSPS etc)

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[1] A student may be entered multiple times in a database according to the fields upon which unduplication occurs. For example, in the department by academic year database, one student would receive more than one entry for each department in which he or she took courses in the academic year of attendance. If they were enrolled in more than one academic year, they would have multiple entries by their years of college attendance.

Databases of the Decision Support System

Table 4

Student Subgroup Fields

Queryable Fields	Description
Student Load	Full time (12 or more units) or part time (fewer than 12 units).
Enrollment Status	Identification of Students as new, continuing, returning etc.
Educational Level	The Highest level of Education students have attained.
Educational Goal	The Goal each student indicates he/she wishes to attain.
Residency	California Resident or other.
Nationality	Country of student Nationality
Zip Code	Zip of current residence.
High School of Origin	Name of High School Student attended.
High School Type	SFUSD, other CA or US high school or Foreign
Ethnicity	
Age	
Gender	
Financial Aid Recipient	BOGG award recipient (yes or no)
ESL Placement	ESL Course placement
Math Placement	Math course placement
English Placement	English course placement
Number Basic Skills Placements	Number of basic skills placements each student received (0, 1 or 2)

Databases of the Decision Support System

Table 5
Student and Course Performance Fields

Display Fields	Description
GPA	Grade point average
Average Units Enrolled	Number of Units in which student enrolled
Average Units Passed	Number of Enrolled units in which student received A, B, C or CR
Average Units Retained	Number of Enrolled units student received a letter grade other than W
Average Attendance Hours	For positive attendance classes only, the number of hours attended
Term-to-term Persistence	The number of students who were in a similar department or division the next term.
Year-to-year Persistence	The number of students who were in a similar department or division the next year.
Average Number of Courses Enrolled	The number of courses a student enrolled in a term.
Percent of Courses Passed	The percent of courses above in which students earned an A, B, C, CR grade.
Percent of Transfer Courses Passed	The Percent of courses that can be transferred to the CSU or UC system that a student received an A, B, C, CR grade.
Percent of Vocational Courses Passed	Above but for courses with a vocational orientation.
% Basic Skills Courses Passed	Above but for courses indicated as pre-collegiate basic skills (below college level).
Course/Section Demand Modules	
Registration Attempts	The number of different attempted registrations is a section or course.
Successful Registrations	The number and percent of registrations attempted that resulted in enrollments
Closed Registrations	The number of percent of registrations in which students received a 'Closed Section' message
Co/Prerequisite	The number of registrations in which students received a co or prerequisite required message.
Repeat	The number of registrations in which students were notified that they were not allowed to repeat a course.
Other	The number of other messages students received (time conflict with another class etc).

3. Endnotes

[i] The author wishes to thank the members of the Office of Research, Planning and Grants at City College of San Francisco for their help in writing this paper. They also deserve the credit for building the college's decision support system. They are: Quyen Lu, Rosita Lucas, Pamela Mery, Steve Spurling. A special thanks to Dr. Nancy Wolfe for helping with the editing of this paper.

[ii] All data in the DSS begins with the new Banner management information system established in Spring 1998. Data prior to Spring 1998 resides in the CCSF archives which we have not tapped.

[iii] City College is one of a number of community colleges in California building a decision support system. We are aware that West Valley/Mission Community College District has already built one. See Chris Olson, "Making Research and Planning Information Available on the Desktop," *RP Proceedings 2000*. There are also systems at Crafton Hills, Saddleback, Foothill/DeAnza, and Grossmount/Cuyamaca. All of them are different but all seek to enhance decision-making.

[iv] "Research and Planning: Educating the Campus Community for Institutional Change and Student Success." *Metropolitan Universities*, Volume 7 Number 2, Fall 1996, 41-50.

[v] "The Politics of Information." *Change Magazine*, Volume 33, Number 3 May/June 2001, 50-57 describes the University of Washington database project with similar design principles.

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EFF-089 (3/2000)